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ABSTRACT

The investigation in this booklet is designed to provide 4-H members with opportunities to identify common plants and animals found on beaches and sand dunes and to determine the role of the plants and animals in this community. Learners are provided with a picture of a hypothetical beach and sand dune and a list of organisms (included in the booklet). Following an exercise in which correct names are matched with correct organisms in the picture, a data base table for the usual niche of each organism is completed. Data include information about where an organism lives, how it feeds, and what relationship it has to other organisms. The investigation includes background information on dunes, beaches, water, beach and dune animals, and the strand line (a zone where debris and flotsam are left as a tide advances and recedes, containing dead plants and animals as well as trash). A list of vocabulary words (with definitions) used in the investigation is also included. (Author/JN)

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4-H MARINE SCIENCE

Member's Guide
Activity I

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A Beach and Dune Community

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Activity I: A Beach And Dune Community*

Adapted from Irby, Bobby N., Man and the Gulf of Mexico
Topic I: Marine and Estuarine Ecology, 1980,
by Mac Rawson, Sea Grant Advisory Service,
Alabama Cooperative Extension Service, Mobile, Alabama

Objectives

To identify some of the common plants and animals found on beaches and sand dunes

To identify the role of different plants and animals on beaches and sand dunes

Introduction

Do you have a favorite beach? Perhaps it's a place your family or friends usually go, and you know it as well as your own backyard.

Unlike your backyard, the beach is constantly changing. Mighty forces such as wind, waves, gravity, sun and animal life constantly act on the beach. This creates problems for the plants and animals that live there. But nature has come up with some fascinating solutions to these problems, so that the beach is a thriving community.

Dunes

Along the Gulf Coast the beaches are sand and just behind the beach are the equally important mounds of sand piled up by the wind, called *sand dunes.*** These sand mounds protect the area behind the beach from flooding during storms.

The dunes are not an accident. They are unlike mountains which were created by forces from within the earth. Instead, dunes are built by the wind, grain by grain. Plants help build the dunes by holding the sand in place. The two most important dune-forming plants are sea oats and saltmeadow cordgrass. To live along the *beach* these plants must be able to live in strong sunlight, temperatures below freezing and above 100°F, strong winds, and changes in *salinity*.

Man and storms have destroyed much of the plant life on the sand dunes. Man did this by burning, building homes, and grazing cattle on the plants. With the plants gone, the wind blew the whole sand dune away. To keep this from happening, scientists have been studying ways to build sand dunes. They have piled sand up with bulldozers, caught sand from the wind with barriers called *sand fences*, and planted grass. However, when the sand is piled up with bulldozers, the wind just blows it back down. Sand fences build up dunes, but when they rot the wind will blow the dune away again.

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*Published in celebration of the Year of the Coast by the Alabama Coastal Area Board, Mississippi-Alabama Sea Grant Consortium and the Alabama Cooperative Extension Service

**Italicized words are defined in the list at the end of this activity guide.

Cultivation of plants seems to be the best method of building sand dunes. As the sand builds up around them, the plants grow. The dune then becomes very large and the plants continue to grow with them.

Sand dune researchers found that sea oats and cordgrass did not grow very rapidly when they planted them. Another grass does grow rapidly and has been helpful in building sand dunes along Alabama shores. It is called "dune panic grass."

Beach

The beach between the sand dune and the ocean gently slopes to the water. Beaches are known as high energy areas because the waves from distant storms release energy here. The waves move up and down the beach as the water level changes with the tides. Ocean beaches are usually covered with broken shells, *driftwood,* and seaweed. No large plants grow there because the waves continuously pound the beaches.

Water

Waves at sea do not push water along with them. However, in shallow water they become breakers that do push water along. If many breakers come to shore at an angle, they cause a current of water along the beach called the *longshore current*. This current moves large amounts of sand along the shore. This makes it very hard for an organism to attach in the sand.

Animals

Since the waves pound the beach with enough energy to break shells, organisms living in the water must have some way to escape the pounding. The coquina [ko-kee-nah], a small *bivalve mollusk*, and the mole crab get protection from the energy of waves and from possible *predators* by burrowing in the sand. Mole crabs and coquinas follow the tide waters from the low part of the beach to the high part by riding waves. As a wave comes in, the animal is uncovered and swept along the waves. When the wave reaches the high part of the beach, the animal buries itself and waits for another wave. Both of these animals are *filter feeders*. Coquinas siphon water much like other bivalve mollusks. The mole crab uses its *antennae*. Its antennae are equipped with many hairlike projections that serve as nets. They stick these antennae out of the sand when a wave passes over and catch the food material from the water.

One floating animal that sometimes gets blown to the beach is the very pretty, but dangerous, Portuguese man-o-war. This animal floats by means of a large, purple balloon-like sail. The Portuguese man-o-war is sometimes a very serious menace on beaches. Children--mistaking them for ballons--may pick them up. Their sting can be very painful. *Tentacles* trail below the balloon and have stinging cells. These *nematocysts* [nem-uh-to-sists] are poisonous and paralyze the small animals which the man-o-war eats.

Many young fishes find food and protection in the shallow surf area. One of these kinds, the pompano [pom-puh-no], is common in summer. Most of these leave this area when they grow larger.

Upon the dry part of the beach, we can detect some rounded holes in the sand. These are burrows of ghost crabs. They use these for protection from weather and from predators. The ghost crab lives out of the water but must still wet its gills.

Another common beach animal is called the beach flea or sand hopper. During daylight hours, this small animal spends its time under the sand or debris on the beach. But at night, it begins to search for food. We can find these animals by turning over debris or by placing a lantern on the beach at night. They are attracted to light.

Besides the animals that are adapted to living in or near the water, there are some that visit the beach to find food. Birds are probably the most common. We can often see sandpipers--like the sanderling--run along the waves picking up the animals that are uncovered by the rushing water. Gulls also feed at the beach. They are *scavengers* and will eat anything they can catch or find. Offshore from the beach, brown pelicans or gannets may be seen diving for fishes,

Strand Line

The zone where debris and *flotsam* are left as the tide advances and recedes is called the *strand line*. This narrow zone contains dead plants and animals, such as fish and algae as well as trash from civilization--light bulbs, plastic bottles, and sometimes driftwood. Probably the easiest place to study a strand line is the sandy beach. It is very hard to distinguish a strand line on other beaches for obvious reasons. It is very difficult to leave a mark on a rocky beach and the muddy beach may be covered with vegetation such as black needlerush which prevents a line being formed.

Both marine and land animals inhabit the strand line. You may find scavengers or predators that feed on the scavengers. The animals of this area must be able to utilize oxygen from the air instead of the water. Some snails have a modified *mantle,* and some crabs are able to hold water in special bronchial chambers. Most of the marine forms are very secretive. They may burrow in the soil or in the debris to provide themselves with some degree of protection from predators. Major predators of this area include seagulls, sandpipers, rats, skunks, flies and beetles.

In the following investigation, you will try to identify the organisms of a beach and dune *ecosystem* and then try to determine the role of the plants and animals (*niche*) in this community

Materials

Guide sheet of the marsh ecosystem.

Procedure

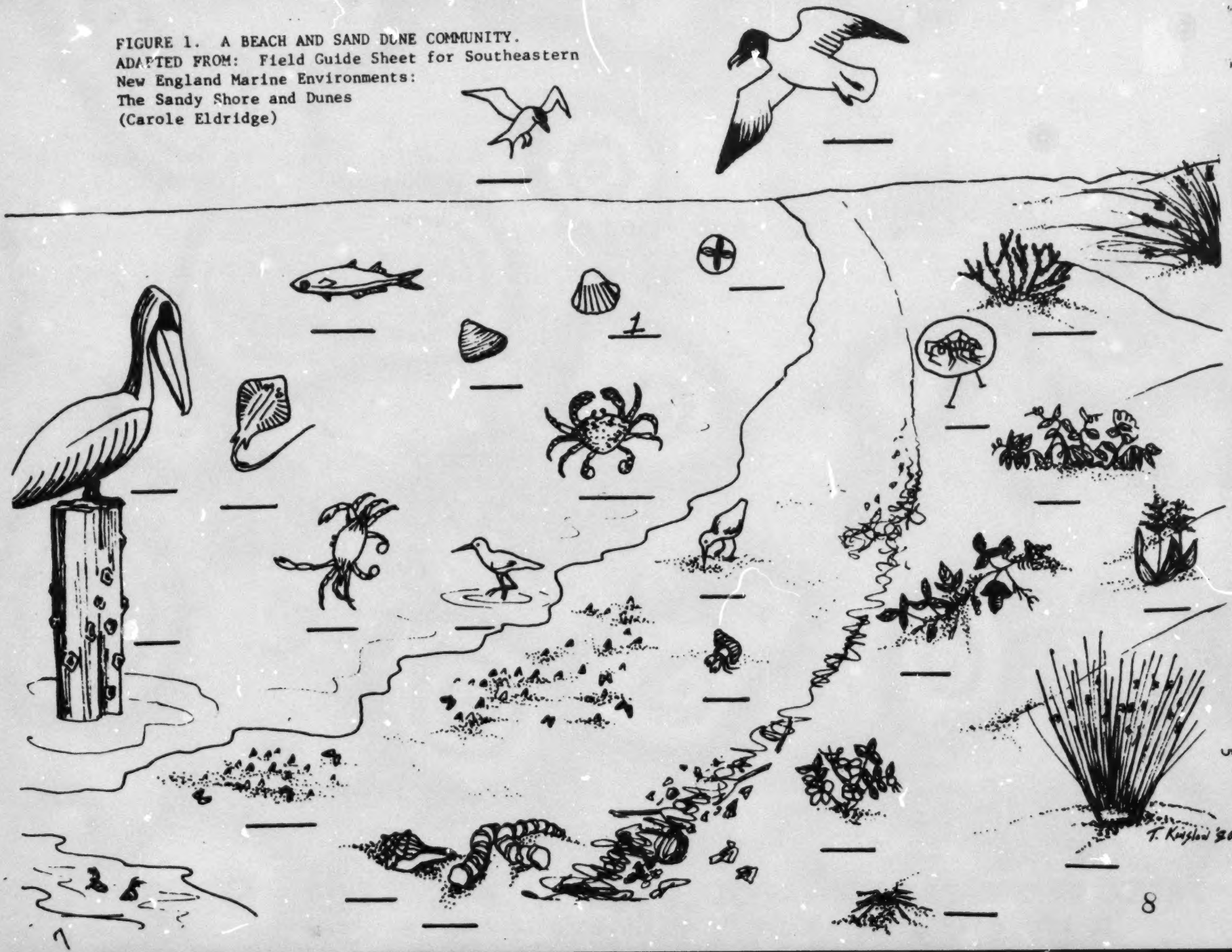
You are provided with a picture of a hypothetical beach and sand dune and a list of the organisms found on the beach and dune. The first thing you are to do is to match the correct name with the correct organism. Place the correct corresponding number under each organism in the picture. (The first one has been done for you.) Once you have named all of the organisms found on the beach

and dune, complete the data table for the usual niche of each organism. Include information about where it lives, how it feeds, and what relationship it has to other organisms. If you do not know about some of the organisms, go to the library and see if you can find a reference book that will enable you to determine each organism's niche in its community. The first one has been done for you.

ORGANISMS ON THE BEACH AND SAND DUNE

1. Ark shell *(Anadara)*
2. Beach pea *(Lathyrus)*
3. Blue crab *(Callinectes)*
4. Brown pelican *(Pelacanus)*
5. Calico crab *(Ovalipes)*
6. Coquina clams *(Donax)*
7. Egg cases
8. Glasswort *(Alicornia)*
9. Greater yellowlegs *(Totanus)*
10. Hermit crab *(Pagurus)*
11. Laughing gull *(Larus)*
12. Least tern *(Sterna albifrons)*
13. Mole crab *(Emerita)*
14. Poison ivy *(Rhus)*
15. Rock (acorn) barnacles *(Balanus)*
16. Salt-spray rose *(Rosa)*
17. Sand dollar *(Echinarachnus)*
18. Sanderling *(Crocethia)*
19. Sandhopper *(Talorchestia)*
20. Sea oats *(Uniola)*
21. Seaside goldenrod *(Solidago)*
22. Silversides *(Menidia)*
23. Southern stingray *(Dasyatis americana)*
24. Surf clam *(Spisula)*
25. Whelk *(Busycon)*
26. Wolf spider *(Lycosa)*

FIGURE 1. A BEACH AND SAND DUNE COMMUNITY.
ADAPTED FROM: Field Guide Sheet for Southeastern New England Marine Environments: The Sandy Shore and Dunes (Carole Eldridge)



Organisms Found in a Beach and Sand Dune

	Name	Usual Role of this Plant or Animal
1.	Ark shell	Lives on ocean bottom; filter feeder; eaten by birds
2.		
3.		
4.		
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VOCABULARY

Antennae - sensory structures used by organisms such as mole crabs in order to capture food

Beach - an almost flat shore of sand or pebbles over which water washes when high

Bivalve - a mollusk possessing a shell of two valves hinged together; includes clams, oysters, and mussels

Drift wood - wood which is carried along by water and eventually washed ashore in the strand line

Ecosystem - a community of organisms interacting with each other and the environment in which they live

Environment - the surroundings of an organism

Filter feeder - any organism which actively filters suspended material out of the water column by creating currents. Examples are tunicates, copepods, oysters and ark shells

Flotsam - materials that are found floating on the sea or washed ashore

Longshore current - an ocean current that flows parallel to a coastline; results from waves striking the shore at an angle

Mantle - a thin membrane covering the digestive organs, excretory organs, and the heart of a mollusk; in some, it secretes a shell

Mollusk - soft-bodied, mostly marine animals, ususlly enclosed within a hard outer shell of calcium carbonate

Nematocysts - stinging cells found in coelenterates (i.e., Portuguese Man-o-War) used for trapping food

Niche - the particular way in which an organism obtains its food and reacts; an organism's way of life

Predator - an animal which attacks and eats other animals for food

Salinity - a measure of the total amount of dissolved salts in seawater

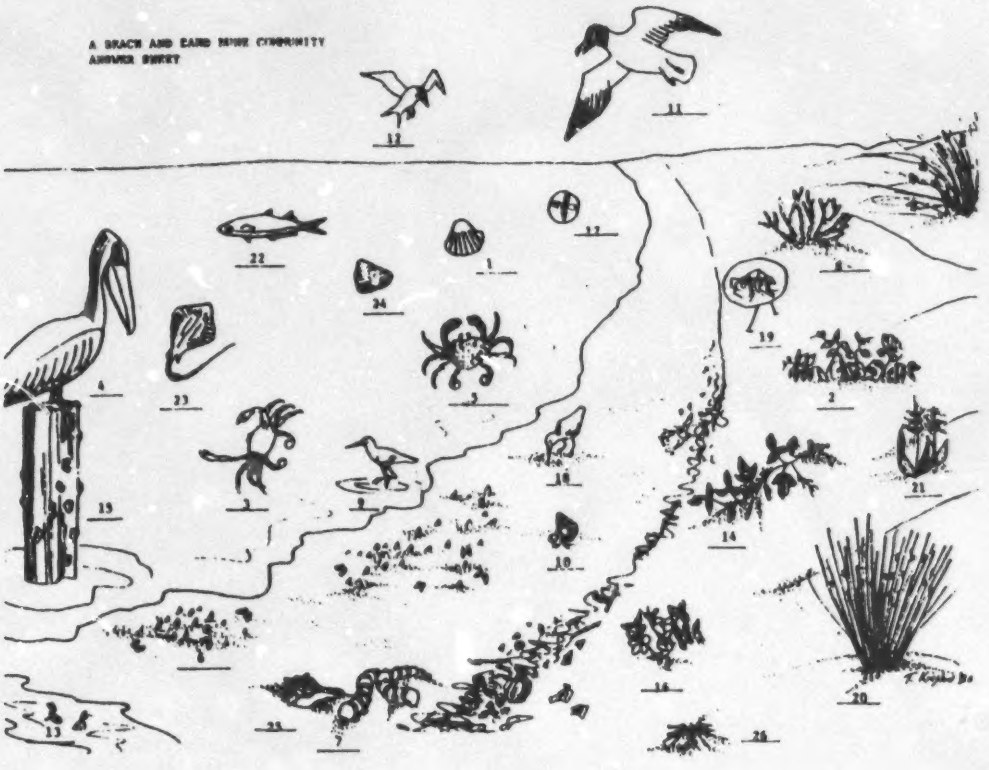
Sand dunes - a mound or ridge of loose sand heaped up by the wind

Sand fence - a method of building sand dunes by using fences

Scavenger - an animal which feeds on the dead remains of other animals and plants

Strand line - a shore line or breach, especially one above the present water level

Tentacles - long appendages, or "feelers," of certain invertebrates



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